

Scientific Note

ATYPICAL SEX ROLE BEHAVIOR IN THE BALL-ROLLING DUNG BEETLE, *CANTHON PILULARIUS* L. (COLEOPTERA: SCARABAEIDAE)

During July, 1990, I observed unusual feeding and reproductive behavior in the ball-rolling dung beetle, *Canthon pilularius* L. On three occasions, females engaged in what have been described as exclusively male behaviors for this species. These observations suggest that the behavioral roles of the sexes of this species may not always be clear-cut.

The feeding and reproductive behavior of this species, and of the Scarabaeinae in general, are described elsewhere (Matthews, E. G. 1963. *Psyche*, 70: 75–93; Halffter, G. & E. G. Matthews. 1966. *Folia Entomol. Mex.*, 12–14: 1–312; Halffter, G. & W. D. Edmonds. 1982. *Publ. Inst. Ecol., Mex. D.F.* 10). In all of these accounts, the male is reported to be the active partner in reproducing pairs; only males engaged in combat over possession of dung balls, and only males initiated formation of brood balls. I report females engaging in both of these activities at the Central Plains Experimental Range near Nunn, Colorado.

Groups of four and 12 beetles were maintained in 0.84 m² outdoor screen cages. The cages were open to the ground to allow normal ball-rolling and digging behavior, and the beetles were provided with a continuous supply of fresh cow dung. The sides of the cages restricted the distances that beetles could roll their dung balls, but this did not appear to affect their behavior in any other way. All individuals were marked with dots of paint to facilitate field identification without disturbance. I observed the beetles on 31 days at 1–4 day intervals throughout the summer of 1990.

On 11 Jul 1990, I observed a female cut and roll a dung ball that later became a brood ball. The cutting process lasted about 20 min, after which the female beetle continued to shape the ball, with occasional attempts at rolling it. Some difficulty was encountered in rolling due to a small stick and a maggot that protruded from the ball. More than 3 h after initiating ball formation, the female began rolling the ball, and 17 min later she began burying it. Six min later, when the ball was already partially buried, she was joined by a male beetle; the two immediately began rolling the ball as a pair, with the male rolling and the female riding atop the ball. After 32 min of rolling, they began burying the ball together. It is not certain that the female initially intended this ball to be a brood ball rather than a food ball, although the extraordinarily long time taken to create the ball is suggestive.

On two other occasions I observed female beetles engage in combat; in at least one of these the combat was initiated by the female. On 7 Jul 1990, when a pair was in the process of burying a brood ball with the male digging beneath the ball to bury it, and the female on top of the ball, another female approached. The two females grappled together, producing clearly audible scraping, while the male continued digging and standing beside the ball. After approximately 1 min, the

intruding female departed and the original pair continued to bury the brood ball. At no time did the male enter the combat, although he emerged from beneath the ball while the combat was still occurring.

The second instance was on 26 Jul 1990. A male was cutting and shaping a dung ball at the dung source when he was approached by a female. A brief fight ensued. Normally this would end quickly with pair-bond formation when the male recognized the sex of the opposing beetle. In this case, however, the fight ended with the female rolling the ball away by herself, the male remaining behind atop the dung pat. The female buried the ball 15 min later, and the male burrowed under the dung pat.

These observations, although anecdotal, indicate that the behavior of *C. pilularius* may be even more complex than has been reported. Previous accounts have shown that males will make a brood ball in the absence of females, apparently choosing the riskier investment in reproduction rather than the more certain feeding opportunity. My observation of a female making a brood ball suggests that females may follow the same strategy. The observations of females engaged in combat suggest that females will fight to defend their reproductive investment if a male is not present, and that females may choose to feed rather than reproduce by stealing a dung ball from a male rather than mating with him.

The unusual behaviors that I observed may be partly due to a more arid environment with shorter summers than those in which previous observations were made (e.g., Miller, A. 1954. *Am. J. Trop. Med. Hyg.*, 3: 372–389; Matthews 1963). The Nunn, Colorado observation site is a semiarid shortgrass prairie near the edge of the geographical range of *C. pilularius*; winters are long and cold, summers are dry and hot, and annual precipitation averages about 325 mm. Different climatic conditions may impose different behavioral strategies upon the beetles. Future observations on these beetles may reveal if the behaviors I observed are repeatable or if they were chance aberrances.

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